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NATIONAL AERONAUTICS  
AND SPACE ADMINISTRATION

NASA-13930 (March 2003)  
NASA  
SUPERSEDING NASA-13930  
(September 1999)

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SECTION 13930

WET AND DRY PIPE SPRINKLER SYSTEMS  
03/03

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers wet and dry fire protection sprinkler systems, hydrants, standpipe equipment, and firehose stations.

Drawings should include the following:

Data on subsurface soil conditions

Location and invert elevations of existing obstructions on the ground surface and existing underground structures and utilities that are to be avoided during construction or are required to be plugged and abandoned or demolished and removed

Invert elevations of all work to be connected to size, type, and extent of selected conduit

Typical cross-section for each nonspecified trench, bedding, and backfill condition, indicating conduit, bedding, and backfill material

Location of soil storage areas and spoil areas on government property where disposal of excess and waste material is permitted

Typical riser details

Areas to be sprinkled, hazard by class, temperature setting of heads, ceiling type, height, and any other special design criteria

Existing alarm-system connections

Proper utilization and coordination of symbols,

legends, or codes for various materials and classed  
conditions as provided in the specifications

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: The following references should not be  
manually edited except to add new references.  
References not used in the text will automatically  
be deleted from this section of the project  
specification.

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The publications listed below form a part of this section to the extent  
referenced:

#### AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC M017 (1992) Manual of Steel Construction,  
Volume II, Connections

#### AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A112.18.1M (1996) Plumbing Fixture Fittings

#### ASME INTERNATIONAL (ASME)

ASME B16.34 (1996) Valves - Flanged, Threaded and  
Welding End

ASME B16.39 (1986) Malleable Iron Threaded Pipe  
Unions, Classes 150, 250, and 300

ASME B16.9 (1993) Factory-Made Wrought Steel  
Buttwelding Fittings

ASME B31.1 (1995) Power Piping

#### ASTM INTERNATIONAL (ASTM)

ASTM A 135 (1996) Electric-Resistance-Welded Steel  
Pipe

ASTM A 183 (1983; R 1990) Standard Specification for  
Carbon Steel Track Bolts and Nuts

ASTM A 234/A 234M (1996; Rev B) Standard Specification for  
Piping Fittings of Wrought Carbon Steel  
and Alloy Steel for Moderate and Elevated  
Temperatures

ASTM A 307	(1994) Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
ASTM A 53	(1996) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 563	(1994) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 563M	(1993) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM C 592	(1980) Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
ASTM D 2000	(1996) Standard Classification System for Rubber Products in Automotive Applications
ASTM F 568	(1995) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners
FM GLOBAL (FM)	
FM P7825	(1997; Supple I, II & III) Approval Guide
MANUFACTURER'S STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 13	(1996) Installation of Sprinkler Systems
NFPA 13E	(1995) Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems
NFPA 14	(1996) the Installation of Standpipe and Hose Systems
NFPA 1963	(1993) Screw Threads and Gaskets for Fire Hose Connections
NFPA 24	(1995) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NFPA 70	(1999) National Electrical Code
NFPA 75	(1995) Protection of Electronic Computer/Data Processing Equipment
NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)	
NICET PDM	(1989; 2nd Ed) Program Detail Manual
U.S. DEPARTMENT OF DEFENSE (DOD)	
MIL-STD 101	(1989; Rev B) Color Code For Pipelines and For Compressed Gas Cylinders
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
FED-STD 595	(Rev B) Colors Used in Government Procurement
FS A-A-1922A	(1995) Shield, Expansion (Caulking Anchors, Single Lead
FS A-A-1923A	(1995) Shield, Expansion (Lag, Machin and Externally Threaded Wedge Bolt Anchors)
FS A-A-1924A	(1995) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)
FS A-A-1925A	(1995) Shield, Expansion (Nail Anchors)
FS A-A-55614	(1995) Shield, Expansion (Non-Drilling Expansion Anchors)
FS A-A-55615	(1995) Shield, Expansion (Wood Screw and Lag Bolt Self-Threading Anchors)
UNDERWRITERS LABORATORIES (UL)	
UL 6	(1996; 11th Ed) UL Standard for Safety - Rigid Metal Conduit

## 1.2 GENERAL REQUIREMENTS

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**NOTE: If Section 15003, "General Mechanical Provisions," is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.**

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Section 15003, "General Mechanical Provisions," applies to work specified in this section. Design and installation shall be in accordance with NFPA

13.

### 1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01330, "Submittals," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.  
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The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

#### SD-01 Preconstruction Submittals

Records of Existing Conditions and Contractor's State Certification shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-02 Shop Drawings

Connection Diagrams shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

Piping Materials  
Supporting Elements  
Fire Department Connections  
Fire Alarm and Detection Systems  
Compressor  
Fire Hose Cabinet stations  
Sprinkler Heads  
Valves

Schematics and Fabrication Drawings shall be submitted for wet pipe sprinkler systems in accordance with paragraph entitled, "General Requirements," of this section.

Fabrication Drawings shall be submitted for Wet Pipe Sprinkler Systems consisting of fabrication and assembly drawings to be performed in the shop prior to installation.

As-Built drawings shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items in sufficient detail and scope to verify compliance with the

requirements of the contract documents.

Piping Materials  
Fire Department Connections  
Valves  
Riser Alarm Equipment  
Compressor  
Fire Hose Cabinet stations  
Standpipe Equipment  
Sprinkler Heads  
Miscellaneous Materials  
Supporting Elements

Equipment and performance data shall be submitted for Fire-Protection System consisting of information on use life, system functional flows, safety features, and mechanical automated details.

#### SD-05 Design Data

Design Analysis and Calculations shall be submitted for automatic sprinkler systems in accordance with paragraph entitled, "System Requirements," of this section.

#### SD-06 Test Reports

Test Reports shall be submitted for the following tests in accordance with the paragraph entitled, "System Testing," of this section.

Pressure Tests  
System Operating Tests  
Air Tests  
Valve-Operating Tests  
Drainage Tests

#### SD-07 Certificates

Quality Assurance Plan shall be submitted in accordance with paragraph entitled, "Quality Assurance Plan," of this section.

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals shall be submitted in accordance with paragraph entitled, "Operation and Maintenance," of this section.

### 1.4 GENERAL REQUIREMENTS

Section 15003, "General Mechanical Provisions," applies to work specified in this section.

Connection Diagrams shall be submitted indicating the relations and connections of the following items. Drawings shall indicate the general



physical layout of all controls, and internal tubing and wiring details.

Schematics and Fabrication Drawings shall be submitted for wet pipe sprinkler systems indicating functional and physical interfaces with facilities and other systems.

As-Built drawings shall be submitted for approval 14 days prior to the acceptance testing phase of the project as described in the paragraph entitled, "System Testing," of this specification section. Two (2) sets of magnetic media and hard copies of all new and revised software and drawings shall be provided with the submittal. As-Built drawings shall document final system configuration including deviations from and amendments to the drawings, and field installation changes, concealed and visible.

DWG Format computer generated floor plan layouts indicating all wet pipe sprinkler system components shall be provided.

Floor plan shall indicate all sprinkler piping (size and length), pipe hangers, sprinkler head type and locations, valves, riser trim and associated components, etc. to comply with NFPA 13, "Working Plans." Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply and return air diffusers. The design shall give full consideration to blind spaces, other system piping, electrical equipment, HVAC ductwork, and all other types of obstructions which could prevent the proper installation and operation of the wet pipe system.

As-built drawings and hydraulic calculations shall be signed and sealed by a Licensed Professional Engineer registered in the state of Florida.

Records of Existing Conditions shall be submitted showing the results of Contractor's survey of work area conditions and features of existing structures and facilities within and adjacent to the job site. Commencement of work shall constitute acceptance of existing conditions.

Contractor's State Certification shall be submitted to the Contracting Officer for approval prior to any work being started on the Wet Pipe Sprinkler System.

Fully verified and dated copies of all test data and results shall be submitted with a copy of the approved test procedure and any factory test information.

Contractor will provide one copy of the test procedures and recording forms for the preliminary tests. For the final acceptance tests, the Contractor will provide 10 copies of the test procedures and recording forms.

#### 1.5 SYSTEM REQUIREMENTS

The work includes designing and providing a new automatic wet pipe sprinkler system consisting of but not limited to a Central Sprinkler system model Shotgun 90 type wet pipe sprinkler valve with all associated trim, OS&Y isolation valve(s), floor drains, flow switch and sprinkler heads. The wet pipe sprinkler system shall be hydraulically designed to meet density and area of coverage requirements using a UL listed or FM

approved hydraulic design program. The design, equipment, materials, installation, workmanship, examination, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 13, NFPA 24, NFPA 75 and except as modified herein. Each system shall include all materials, accessories, and equipment inside and outside the building to provide an operationally compliant system. The system design shall give full consideration to blind spaces, piping, electrical equipment, ductwork, and other construction and equipment in accordance with detailed drawings to be submitted for approval prior to installation. Locate sprinkler heads in a consistent pattern with ceiling grids, lights, speakers, supply diffusers and return diffusers.

Contractor shall provide all additional equipment, junction boxes, conduit, and labor to meet the requirements and intent of this specification.

Design Analysis and Calculations shall be submitted for automatic sprinkler systems including spray areas, hazard by class, and temperature setting of heads.

#### 1.6 QUALITY ASSURANCE PLAN

Equipment to be provided under this specification shall be that manufactured sprinkler system equipment which meets the requirements of the section entitled, "System Requirements." It shall be the latest standard design, and shall be listed by Underwriters' Laboratories or approved by Factory Mutual and shall be suitable for the intended use.

Contractor shall prepare a test procedure and test record forms for conducting and recording complete tests on wet pipe sprinkler systems installed in accordance with the hydraulic calculations, the installation drawings and these specifications. Contractor shall submit for approval the test procedure to the Contracting Officer at least 30 days prior to the preliminary system test described in the paragraph entitled, "System Testing," of this specification section. Test procedure shall identify each sprinkler component to be tested, describe the initial condition, each step or function in the test, required test results, and equipment to be employed. Test forms with suitable spaces shall be provided for recording test results on all equipment, devices, and wiring to be tested. Test record forms will also have identified spaces for verification signatures of official witnesses and dates of the test.

Contractor shall submit proof that all components are Underwriter Laboratory (UL) listed or Factory Mutual (FM) approved for their intended use and function.

#### 1.7 SERVICES OF A CERTIFIED AUTOMATIC SPRINKLER SPECIALIST

Services of a Certified Specialist thoroughly experienced in automatic sprinkler system installations shall be provided on site to perform or directly supervise the installation, make all necessary adjustments and perform all tests on the wet pipe sprinkler system at the site.

Sprinkler System Specialist shall be considered certified when the specialist holds a valid Sprinkler System Layout, Level III Certification

from the National Institute for Certification in Engineering Technologies or is licensed by the State of Florida as a Contractor Class I in accordance with Florida State Statute, Chapter 633, Section 633.521 and holds a current Certificate of Competency.

Certification of other recognized agencies with equivalent requirements will be considered. Evidence of the equivalent certification and the basis of certification shall be provided to the Contracting Officer and be approved by the Contracting Officer prior to any work being performed at Kennedy Space Center. Contractor submitted certification requirements shall be in accordance with NICET PDM.

## PART 2 PRODUCTS

### 2.1 GENERAL

Fire-protection system materials and equipment provided under this section shall conform to the requirements of Underwriters Laboratories (UL) or the Factory Mutual (FM P7825) Approval Guide.

Products with UL label or seal or listing in UL 6, and products with FM label or listed in the FM P7825 Approval Guide are acceptable fire-protection system materials and equipment. Materials and equipment furnished shall be compatible with existing system.

### 2.2 PIPING MATERIALS

#### 2.2.1 Type BCS - Black Carbon Steel

Pipe (1/8 through 1-1/2 inches)(DN6 through DN40): Schedule 40 furnace butt weld black-carbon steel conforming to ASTM A 53, or ASTM A 135, Type F furnace butt welded; Schedule 10 conforming to ASTM A 135, Grade B

Pipe (2 through 8 inchesDN50 through DN206, where indicated): Schedule 40 seamless or electric-resistance welded black carbon steel, conforming to ASTM A 53 or ASTM A 135, Type E (electric-resistance welded), Grade B, or Type S (seamless), Grade B; Schedule 10 conforming to ASTM A 135, Grade B

Unions (2 inchesDN50 and under): 300-pound per square inch gage (psig) 2068 kilopascal working steam pressure (wsp) female, screwed, black malleable iron, with ground joint and brass-to-iron seat conforming to ASME B16.39

Grooved pipe couplings (all sizes): 175-psig 1207 kilopascal minimum working pressure with a housing fabricated in two or more parts of black malleable-iron castings. Coupling gasket shall be molded of synthetic rubber, conforming to requirements of ASTM D 2000. Coupling bolts shall be oval-neck, track-head type with heavy hexagonal nuts, conforming to ASTM A 183

Grooved fittings (all sizes): 175-psig 1207 kilopascal working pressure fittings used with grooved couplings shall be fabricated of black malleable-iron castings. If a manufacturer's standard-size malleable-iron fitting pattern is not available, fabricated fittings shall be used;

fittings shall be fabricated from Grade B seamless-steel pipe and long-radius seamless welding fittings, with wall thickness to match pipe, conforming to ASTM A 234/A 234M and ASME B16.9.

## 2.3 SUPPORTING ELEMENTS

Piping system components and miscellaneous supporting elements shall be provided, including, but not limited to, building-structure attachments; standpipe equipment and fire hose cabinet stations; supplementary steel; hanger rods, stanchions, and fixtures; vertical-pipe attachments; horizontal-pipe attachments; restraining anchors; and guides. Supporting elements shall be suitable for stresses imposed by systems pressures and temperatures, natural, and other external forces.

\*\*\*\*\*  
**NOTE: Refer to Section 15072, "Vibration Isolation  
for Air Conditioning Equipment," if design may  
induce vibration considerations.**  
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Supporting elements shall be FM approved or UL listed and shall conform to ASME B31.1, MSS SP-58, and ASME B16.34.

### 2.3.1 Building-Structure Attachments

#### 2.3.1.1 Anchor Devices, Concrete and Masonry

Anchor devices shall conform to FS A-A-1922A, FS A-A-1923A, FS A-A-1924AA, FS A-A-1925A, FS A-A-55614 and FS A-A-55615:

Group I: Shield, expansion (lead, bolt, and stud anchors)

Group II: Shield, expansion (bolt anchors), Type 2, Class 2, Style 1 or 2

Group III: Shield, expansion (self drilling tubular expansion shell bolt anchors)

Cast-in floor-mounted equipment-anchor devices shall provide adjustable positions.

Powder-actuated anchoring devices shall not be used to support mechanical-systems components.

#### 2.3.1.2 Beam Clamps

Beam clamps shall be center-loading Types 21, 28, 29, and 30, UL listed, cataloged, and load-rated commercially manufactured products.

Type 20 beam clamps shall be used for pipe 2 inches DN50 and under.

Two Type 25 beam clamps shall be used per point of pipe support.

#### 2.3.1.3 C-Clamps

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**NOTE: C-clamps, as a means of attaching hangers to structural steel, should be avoided. Where used, consider vibration forces and single or accumulated load and resultant moment on structural steel.**  
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C-clamps shall not be used.

#### 2.3.1.4 Inserts, Concrete

Concrete inserts shall be constructed in accordance with the requirements of MSS SP-58 for Type 18 or 19 and ASME B16.34. When applied to piping in sizes 2-inch DN50 iron pipe size (ips) and larger, and where otherwise required by imposed loads, a 1-foot length of 1/2-inch 300 millimeter length of 15 millimeter reinforcing rod shall be inserted and wired through wing slots.

#### 2.3.2 Horizontal-Pipe Attachments

##### 2.3.2.1 Single Pipes

Piping in sizes up to and including 2-inch DN50 ips shall be supported by Type 1, 5, 6, 7, 9, 10, 11, or 12 solid, split-ring, or band type attachments.

Piping in sizes 2-1/2 inches DN65 and larger shall be supported by Type 1, 2, 3, or 4 attachments or with Type 41 or Type 49 pipe rolls.

##### 2.3.2.2 Parallel Fire-Protection Pipes

Trapeze hangers fabricated from approved structural steel shapes, with U-bolts, shall be used when so specified. Structural-steel shapes shall conform to supplementary steel requirements or the support shall be of commercially available, approved proprietary-design rolled steel.

#### 2.3.3 Vertical-Pipe Attachments

Single vertical-pipe attachments shall be Type 8.

#### 2.3.4 Hanger Rods and Fixtures

Only circular solid cross section rod hangers shall be used to connect building structure attachments to pipe-support devices. Pipe, straps, or bars of equivalent strength shall be used for hangers.

Turnbuckles, swing eyes, and clevises shall be provided as required by support system to accommodate temperature changes, pipe accessibility, and adjustment for load and pitch.

#### 2.3.5 Supplementary Steel

Where it is necessary to frame structural members between existing members or where structural members are used in lieu of commercially rated supports, such supplementary steel shall be designed and fabricated in accordance with AISC M017.

## 2.4 SPRINKLER RISER EQUIPMENT

Riser alarm equipment shall be UL listed or FM approved for fire-protection use.

### 2.4.1 Standard Check Valve

Check valve shall be UL listed or FM approved standard swing-check type with elastomer-disc seat. Check valve shall be flanged clear opening type with flanged inspection and access cover plate for sizes 4 inches and larger. Check valve shall be able to be installed vertically or horizontally.

### 2.4.2 Wet Pipe Valve

Wet Pipe valve shall be a Central Sprinkler Company Shotgun 90 type or equal type complete with standard accessories and trim necessary to give an alarm, shall include pressure gages, testing provisions, and all necessary intercomponent water piping, fittings, and valves.

System shall include a trouble alarm indicating a loss of air pressure.

### 2.4.3 Water-Flow Alarm Device

Water-flow alarm devices shall be UL listed for the particular type of system. Water flow switch shall be wired to make or break a circuit on rise of water pressure. Water flow switch shall have an integral field adjustable 0-90 second retard feature.

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**NOTE: Rewrite following for dc systems.**  
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## 2.5 FIRE DEPARTMENT CONNECTIONS

Hose connections shall have National Fire hose standard-thread form and rocker lugs in accordance with NFPA 1963. Hose connection sizes and threads shall be compatible with the equipment used by the fire department serving the facility.

### 2.5.1 Wall Siamese

Unit shall be cast brass or bronze flush-mounted escutcheon-plate type, with two 2 1/2-inch DN65, fire-department, swivel, female inlets; double-clapper valves; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish shall be chrome-plated or polished surface. Chrome plate shall be in accordance with ANSI A112.18.1M.

### 2.5.2 Sidewalk Siamese

Unit shall be cast brass or bronze, with two 2 1/2-inch DN65, fire-department, swivel, female inlets; double-clapper valves; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish shall be chrome-plated or polished surface. Chrome plate shall be in accordance with ANSI A112.18.1M. Unit shall be mounted on a Schedule 40 ASTM A 53 galvanized carbon-steel pipe with red-enameled finish on prime-coated surface. All surfaces embedded in concrete or below grade shall be protected with a 20-mil 0.508 millimeter thick bituminous coating.

#### 2.5.3 Wall Hydrant

Unit shall be cast brass or bronze flush-mounted escutcheon-plate type with two 2 1/2-inch DN65, fire-department, male outlets; rocker-lug caps and chains; and cast-in function-identifying lettering. Finish shall be chrome-plated or polished surface. Chrome plate shall be in accordance with ANSI A112.18.1M.

#### 2.5.4 Roof Manifold

Unit shall be cast brass or bronze, horizontal type, with two 2 1/2-inch, 175-pound DN65 1200 kilopascal, rated hose valves fitted with rocker-lug caps and chains. Finish shall be rough body with polished trim.

#### 2.5.5 Fire Hydrants

Hydrants shall be dry-barrel type, with low-profile and modern appearance. Hydrants shall be designed to remain closed if hydrant barrel is sheared or damaged. Unit shall have two 2 1/2-inch DN65, hose outlets and one 4 1/2-inch DN115 hose outlet complete with nonbinding caps and cap chains. Hydrant direction of opening shall be counterclockwise. Surface shall be filled, primed, and finished with a multiple-coat high-gloss weather-resistant enamel. All surfaces below grade shall receive a coating of bitumen not less than 20 mils 0.508 millimeter thick. Care shall be exercised not to plug barrel drainage provisions. Color shall be standard for the project site.

### 2.6 DRY-PIPE MAINTENANCE AIR

#### 2.6.1 Independent Source

Dry-pipe system air pressure shall be maintained by an independent air compressor mounted on the riser. Compressor shall be spring and elastomer vibration-isolated from the riser, of oil-free construction, complete with adjustable set point low-differential pressure switch, check valve, and necessary unloader and intercomponent piping and wiring. Spare inlet-air filter media shall be provided.

#### 2.6.2 Retard Orifice

Air-supply line near each dry-pipe valve shall be provided with an orifice union with a 1/8-inch 3 millimeter orifice corrosion-resistant steel plate, externally identified, and a 1/2-inch DN15 three-valve bypass around the orifice union.

## 2.7 SPRINKLER HEADS

### 2.7.1 Head Types

Standard 1/2-inch 13 millimeter orifice sprinkler heads shall be used.

Heads in finished areas below suspended ceilings shall be flush chrome-plated brass. Escutcheon plate shall be baked enamel finished to match ceiling.

Heads in finished areas below suspended ceiling shall be flush or pendant type. Heads and escutcheon plates shall be chrome-plated brass.

Heads in unfinished areas below suspended ceilings shall be pendant type. Heads in all other locations shall be [upright] [pendant] [sidewall] type.

Corrosion-resistant heads shall be lead-coated.

### 2.7.2 Temperature Rating

Fusible links shall be for ordinary temperature classification, except where otherwise indicated.

### 2.7.3 Spares

Spares shall be furnished for each type of sprinkler head, complete with appropriate storage cabinet and wrench.

### 2.7.4 Head Protection

Heads shall be protected with paper or plastic bags during painting operations. Protection shall be removed immediately upon finishing painting operations.

Head guards shall be provided wherever mechanical damage could occur. Guard finish shall be red enamel.

## 2.8 VALVES

### 2.8.1 Aboveground

Gate, globe, and check valves (all sizes) shall be FM approved or UL listed.

Ball valves, 2 inches DN50 and under, shall be FM approved, rated 300 psi 2070 kilopascal, with provisions to wire or lock handle in place where critical alarm function may be isolated.

## 2.9 MISCELLANEOUS MATERIALS

### 2.9.1 Bolting

Flange and general-purpose bolting shall be hex-head and shall conform to ASTM A 307, Grade B ASTM F 568, Class 4.8 or higher. Heavy hex-nuts shall



conform to ASTM A 563. ASTM A 563M. Square-head bolts and nuts are not acceptable.

#### 2.9.2 Escutcheons

Escutcheons shall be manufactured from nonferrous metals and shall be chrome-plated, except when AISI 300 series corrosion-resistant steel is provided. Metals and finish shall conform to ANSI A112.18.1M.

Escutcheons shall be one-piece type where mounted on chrome-plated pipe or tubing and one-piece or split-pattern type elsewhere. Escutcheons shall have provisions consisting of internal spring tension devices or setscrews to maintain a fixed position against a surface.

#### 2.9.3 Flange Gaskets

Gaskets shall be suitable for the intended use and shall contain no asbestos.

#### 2.9.4 Pipe-Thread Compounds

Tetrafluoroethylene tape or other suitable compounds shall be used.

### 2.10 FIRE-PROTECTION SYSTEM IDENTIFICATION

A coordinated system of piping and equipment identification shall be provided which includes the following:

- Framed and plastic-protected diagrammatic layout of all piping systems, identifying and locating piping, equipment, and valves. Where existing systems are being modified, existing layouts shall be brought up to date.

- Metal-tag-identified major valves, piping-system components, and equipment

- Metal identification plate at controlling alarm valve identifying system and area protected

- Service-labeled piping

#### 2.10.1 Diagrams

Chart listing of equipment shall be by designation number and shall show pertinent data. Diagrams shall be neat, mechanical drawings mounted in extruded aluminum frames, with 1/8-inch 3 millimeter thick acrylic plastic protection. Location shall be as directed by the Contracting Officer. A minimum of one mounted chart and diagram, plus one extra copy of each, shall be provided for each fire-protection system.

#### 2.10.2 Metal Tags

Identification tags made of brass or aluminum and indicating function of valve or similar component, shall be installed on such system devices.

Tags shall be not less than 2 inches 50 millimeter in diameter and marking shall be stamped.

Equipment shall be provided with metal identification tags bearing an equipment designation number matching the drawing or diagram designations.

Tags shall be secured to valve or equipment items with 12-gage 2.7 millimeter galvanized wire.

#### 2.10.3 Service Labeling

Piping, including that concealed in accessible spaces, shall be labeled to designate service. Each label shall include an arrow or arrows to indicate flow direction. Labels or tag designations shall be as follows:

<u>SERVICE</u>	<u>LABEL OR TAG DESIGNATION</u>
Main sprinkler supply	MAIN SPRINKLER SUPPLY
Sprinkler riser number	SPRINKLER RISER NO.
Sprinkler branch	SPRINKLER BRANCH
Standpipe equipment	STANDPIPE

Piping shall be labeled and arrowed in accordance with the following:

Each point of entry and exit through walls

Each change in direction

In congested or hidden areas, at each point required to clarify service or indicate hazard

In long straight runs, labels shall be located at a distance visible to each other, but in no case shall the distance between labels exceed 40 feet 12.2 meter.

Label lettering shall be 2 inches 50 millimeter high. Where the size of pipes is 2-1/2-inch 65 millimeter outside diameter and smaller, labels shall be attached to 16-gage 1.6 millimeter aluminum sheet which shall be attached to the pipe with 12-gage 2.7 millimeter galvanized wire. Labels shall be legible from the primary service and operating area.

Labels shall be made of self-sticking plastic film designed for permanent installation. Labels shall have red letters on white background.

Label and valve tag schedule above shall not be construed as defining or limiting the work. All piping systems shall be labeled.

#### 2.11 PAINTING

Equipment of the manufacturer's standard product shall be furnished with the manufacturer's standard finish coat.

Other mechanical equipment shall be furnished with a shop-applied prime paint.

### PART 3 EXECUTION

\*\*\*\*\*  
**NOTE: Rewrite following paragraph if no NFPA 13, NFPA 13E, NFPA 14, or NFPA 24 work is included in project.**  
\*\*\*\*\*

#### 3.1 GENERAL

Installation of system materials and equipment shall be in accordance with the recommendations and provisions of NFPA 13, NFPA 13E, NFPA 14, and NFPA 24. Work shall be performed in the presence of the Contracting Officer who shall be notified by the Contractor 48 hours in advance of the start of work.

All installation work shall be performed by licensed fire protection sprinkler contractors, licensed for such work in the state where the work is to be performed.

#### 3.2 ABOVEGROUND PIPING-SYSTEMS INSTALLATION

Piping shall run parallel with the lines of the building. Piping and components shall be spaced and installed so that a threaded pipe fitting may be removed between adjacent pipes and so that there will be not less than 1/2 inch 13 millimeter of clear space between the finished surface and other work and between the finished surface of parallel adjacent piping. Hangers on different adjacent service lines running parallel shall be arranged to be in line with each other and parallel to the lines of the building.

Load rating for pipe-hanger supports shall be based on all lines filled with water. Deflection per span shall not exceed slope gradient of pipe. Schedule 40 and heavier ferrous pipe supports shall be in accordance with the following minimum rod size and maximum allowable hanger spacing. For concentrated loads such as valves, allowable span shall be reduced proportionately.

PIPE SIZE		ROD SIZE	HANGER SPACING FOR		
STEEL PIPE			STEEL PIPE (DN)		ROD SIZE
(INCHES)	(INCHES)		(FEET)	(MILLIMETRE)	
<u>(MILLIMETRE)</u>	<u>(MILLIMETRE)</u>				
Up to 1		3/8	8	25	10
2400					
1-1/4		3/8	12	32	

PIPE SIZE		ROD SIZE	HANGER SPACING FOR		ROD SIZE
STEEL PIPE			STEEL PIPE (DN)		
(INCHES)	(INCHES)		(FEET)	(MILLIMETRE)	
<u>(MILLIMETRE)</u>	<u>(MILLIMETRE)</u>				
10	3600				
10	1-1/2	3/8	15	40	
	4500				
10	2-1/2 to 3-1/2	3/8	15	65 to 90	
	4500				
15	5	1/2	15	125	
	4500				
15	6	1/2	15	100	
	4500				
15	8	1/2	15	150	
	4500				

Vertical risers shall be supported at the base where possible and at intervals specified. Piping shall be guided for lateral stability as necessary. Clamps shall be placed under fittings wherever possible. Carbon-steel pipe shall be supported at each floor at not more than 15-foot 4.5 meter intervals for pipe 2 inches DN50 and smaller, and at not more than 20-foot 6.1 meter intervals for pipe 2-1/2 inches DN65 and larger.

Piping shall be securely supported with allowance for thrust forces and thermal expansion and contraction and shall not be subject to mechanical, chemical, vibrational, or other damage, in conformance with ASME B31.1.

### 3.3 SOUND STOPPING

Effective sound stopping and adequate operating clearance shall be provided to prevent structure contact where piping penetrates walls, floors, or ceilings; into occupied spaces adjacent to equipment rooms; where similar penetrations occur between occupied spaces; and where penetrations occur from pipe chases into occupied spaces. Occupied spaces include space above ceiling where no special acoustic treatment of ceiling is provided. Penetrations shall be finished to be compatible with surface being penetrated.

Sound stopping and vapor-barrier sealing of pipe shafts, and large floor and wall openings may be accomplished by packing with properly supported mineral fiber insulation or by foaming-in-place with self-extinguishing, 2-pound 0.9 kilogram density polyurethane foam to a depth not less than 6 inches 150 millimeter. Foam shall be finished with a rasp. Vapor barrier shall be not less than 1/8-inch 3 millimeter thickness of vinyl mastic applied to visible and accessible surfaces. Where fire stopping is a consideration, only mineral fiber shall be used, and, in addition, openings shall be covered with 16-gage 1.6 millimeter sheet metal.

### 3.4 SLEEVES

Sleeves shall be provided where piping passes through roofs, masonry or concrete walls, or floors.

Sleeves passing through steel decks shall be continuously welded or brazed to the deck.

Sleeves extending through floors, roofs, or load-bearing walls, and sleeves through fire barriers shall be continuous and fabricated from Schedule 40 steel pipe with welded anchor lugs. Other sleeves shall be formed by molded linear polyethylene liners or similar materials that are removable. Diameter of sleeves shall be large enough to accommodate pipe, insulation, and jacketing without touching the sleeve, and additionally shall provide a minimum 3/8-inch 10 millimeter clearance. Sleeve shall accommodate mechanical and thermal motion of pipe to preclude transmission of vibration to walls and generation of noise.

Space between a pipe and the inside of a pipe sleeve or a construction surface penetration shall be packed solid with mineral fiber conforming to ASTM C 592 wherever the piping passes through firewalls, equipment-room walls, floors, and ceilings connected to occupied spaces, and other locations where sleeves or construction-surface penetrations occur between occupied spaces. Where sleeves or construction-surface penetrations occur between conditioned and unconditioned spaces, the space between a pipe, bare or insulated, and the inside of a pipe sleeve or construction-surface penetration shall be filled with an elastomer calk to a depth of 1/2 inch 15 millimeter. Surfaces to be calked shall be oil- and grease-free.

Exterior wall sleeves shall be calked watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

### 3.5 ESCUTCHEONS

Escutcheons shall be provided at penetrations of piping into finished areas. Where finished areas are separated by partitions through which piping passes, escutcheons shall be provided on both sides of the partition. Where suspended ceilings are installed, plates shall be provided at the underside only of such ceilings. Escutcheons shall be chrome plated in occupied spaces and shall conceal openings in building construction. Escutcheons shall be firmly attached.

### 3.6 BRANCH-LINE TESTERS

Branch-line testers shall permit testing and flushing lines without shutdown of system or loss of fire-protection capability. Line testers shall be fitted with chain-attached caps.

Line testers shall be installed where indicated and on most remote branch lines being served by cross mains, so that testing may be accomplished at the dead corners of each sprinkler system.

### 3.7 PAINTING

Manufacturer's standard-finish equipment surfaces damaged during construction shall be brought to as-new condition by touchup or repainting to the satisfaction of the Contracting Officer, or replaced with new undamaged equipment at no additional cost to the Government.

Pipe hangers, supports, and other iron work in concealed spaces shall be thoroughly cleaned and painted with one coat of primer paint.

All wet pipe system piping, valves, and appurtenances, shall receive two coats of enamel, color No. 11105 (red) in accordance with MIL-STD 101 and FED-STD 595.

### 3.8 ELECTRICAL WORK

Electrical work is specified in Division 16, "Electrical," for control system wiring which shall be provided under Section 13850 "Fire Alarm and Detection Systems" and this section in accordance with NFPA 70. Rigid metal conduit or intermediate metal conduit shall be used, except that electrical metallic tubing may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

### 3.9 SYSTEM TESTING

Prior to acceptance of the work, completed systems shall be tested in the presence of the Contracting Officer. Upon approval, certificates of testing shall be provided.

Pressure tests shall be performed, unless otherwise specified. Only potable water shall be used for testing.

[System operating tests, air tests, valve-operating tests, and drainage tests shall be performed for dry-pipe systems.]

Full opening of the inspector's test connection, shall cause the wet pipe valve to trip and deliver a steady stream of water at the test outlet through a calibrated orifice equivalent in diameter to a single system sprinkler head. [If a steady stream at the outlet can not be delivered within the 60 seconds then an accelerator(s) shall be installed per the manufacturer's requirements to meet the 60 second discharge time in accordance with NSS 1740.11 NASA Safety Standard for Fire Protection for Dry Pipe Systems.]

Government will supply testing water at a location determined by the Contracting Officer, but the Contractor shall be responsible for approved disposal of contaminated water.

Contractor shall prepare and maintain test records of piping-system tests. Records shall show personnel responsibilities, dates, test-gage identification numbers, ambient and test-water temperatures, pressure ranges, rates of pressure drops, and leakage rates. Each test acceptance shall require the signature of the Contracting Officer.

#### 3.9.1 Test Gages

Test gages, to be acceptable, shall have 4-1/2-inch 115 millimeter dials or larger with accuracy of plus or minus 1/2 of 1 percent of full-scale range and dial graduations and pointer width compatible with readability to within one-half of the accuracy extremes. Maximum permissible scale range for a given test shall be such that the pointer during a test shall have a starting position at midpoint of the dial or within the middle third of the scale range. Certification of accuracy and correction table shall bear a date within 90 days prior to the test, test gage number, and the project number.

### 3.9.2 Test and Acceptable Criteria

Aboveground systems shall be tested at 200 psi 1380 kilopascal and the applied pressure shall be maintained without further addition of test media for not less than 2 hours. Maximum allowable pressure drop shall be 2 psi 14 kilopascal.

Underground systems, rubber-jointed ferrous-pipe water systems shall be tested at 200 psi 1380 kilopascal, and the applied test pressure shall be maintained for not less than 2 hours. Maximum allowable pressure drop shall be 2 psi 14 kilopascal. After satisfactory hydrostatic testing, piping shall be tested for leakage as follows:

Duration of each leakage test shall be not less than 2 hours; during the test, the main shall be subjected to 200 psi pressure based on the elevation of the lowest section under test and corrected to the elevation of the test gage. No leakage in the above ground piping shall be acceptable.

Backflow prevention into connected potable-water systems and system devices shall be tested for proper functioning under conditions normal to their application.

Dripping or weeping joints shall be repaired.

### 3.10 DISINFECTION

Water piping, including valves, fittings, and other devices, shall be disinfected with a solution of chlorine and water. Solution shall contain not less than 50 parts per million (ppm) of available chlorine. Solution shall be held for a period of not less than 8 hours, at which time the solution shall contain a minimum residue of 2 ppm of available chlorine or the system shall be re-disinfected. After successful disinfection the piping shall be thoroughly flushed before placing into service. Water for disinfection, and flushing will be furnished by the Government.

### 3.11 CLEANING AND ADJUSTING

At the completion of the work, all parts of the installation shall be thoroughly cleaned. Equipment, pipes, valves, and fittings shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system. Automatic control devices shall be adjusted for proper operation.

### 3.12 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals, grouped by technical sections consisting of manufacturer's standard brochures, schematics, procedures, recommended spare parts, recommended test equipment, and safety precautions. This information shall be submitted prior to acceptance tests being performed.

-- End of Section --